

Sub-angstrom Resolution Electron Diffraction Imaging of Nanoclusters

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Diffraction imaging with a coherent electron beam is a promising approach to provide diffraction-limited atomic resolution. However, realizing this requires solving a number of issues, including experimental recording of high quality electron diffraction patterns, the robustness of reconstruction algorithms in the presence of experimental noises, the support and its effect on reconstruction, last but not least important, the dynamic scattering of electrons. In this presentation, we demonstrate the experimental approach for coherent diffraction of individual nanoparticles and implementation of phase retrieval algorithms to achieve atomic resolution by diffractive imaging. The results of a series of simulations will also be presented to show the effects of dynamical scattering, noise and interference with substrates on phase retrieval, and to establish effective inversion procedures. A new iterative algorithm, which uses a low-resolution image in the object domain, is proposed. With the help of the new algorithm, experimental diffraction patterns from individual nanoclusters can routinely be inverted.